

# **DRAFT CURRICULUM**

**In the subject of**

**Environmental Studies**

**For Classes**

**(XI-XII)**

*Developed by*

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## LIST OF CONTENTS

<i>S. No</i>	<i>Contents</i>	<i>Page No.</i>
1	Introduction	1
2	Aims & Objectives	2
3	Chapter I	3
4	Chapter II	4
5	Chapter III	5
6	Chapter IV	6
7	Chapter V	7
8	Chapter VI	8
9	Chapter VII	9
10	Chapter VIII	10
11	Chapter IX	11
12	Guide line for the text book writers	12
13	Teacher training	14
14	Strategies for Teaching	15
15	Assessment and Evaluation	16
16	List of participants	17

## **PREFACE**

A nation without means of reforms is a nation without means of survival. The best course to make reforms is always remain in education. The Federal Govt of Pakistan feels the need of modifying, revising and making abreast of time the curricula across the levels and subjects (I-XII). Form now in consonance of National Education Policy (1998-2010) already pure sciences, social sciences and languages curricula in two phases i.e 2002 AD and 2001 AD respectively have been designed and developed in collaboration with all 4 Curriculum Bureaux accordingly. This is the 3<sup>rd</sup> phase - 29 subjects yet 61 level is in operation.

The NWFP Curriculum & Teacher Education Directorate under the auspices of the Secretary School & Literacy Department and certainly in collaboration with Federal Ministry of Education, Curriculum Wing, Islamabad has convened various Provincial Draft Curriculum Development Committees meetings comprising working teachers, Subject Specialists, University/College teachers and Curriculum Developers to prepare the document in selected disciplines as per availability of financial assistance.

The curriculum development has always been remain continuous process. Indeed, to accomplish this titanic task one needs immense commitment, stout vigour and profound professional insight. Special gratitude to Almighty Allah that such head & heart qualities were found among the members of the committees and others engaged in the process.

We don't claim that this work is complete in all respect. However, the Ministry can ameliorate it through the modicum efforts of NCDC. Before going to depart I must like to appreciate to both committee members and all subject specialists plus officials for fulfilling the task despite the snags and limitation.

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## INTRODUCTION

The curriculum for environmental studies as an optional subject for classes IX-X is a pioneering initiative by the Federal Bureau of Curriculum. The purpose of this curriculum is to address the deteriorating condition of our environment through proper education for our upcoming generations. As we are aware, in the past centuries our earth has faced tremendous pressure on its air, water, land and biological resources due to the current developmental model. These resources are being exploited at a much faster rate. The water (both fresh and marine) is polluted with domestic, industrial and agricultural waste, which is turning our most needful resource into poison. The air, without which we can't survive more than three minutes, is being polluted from industrial emissions, burning of fossil fuels, burning of solid waste in open air, production of electricity and to a minor extent from natural disaster such as volcano eruption. Our land, a source of our survival through provision of food, shelter and pleasant environment is under threat due to over grazing, over cultivation, mismanagement of irrigation practices and deforestation, which is causing erosion thus accelerating the process of desertification. Biodiversity, a hub of the wheel of life, is facing threats of habitat loss, pollution, wildlife trade, introduction of alien species and illegal poaching and hunting. This has resulted into rapid extinction of many species, even before they are discovered.

During the middle of the last century, the world started viewing these environmental issues as major threat for human survival. For this purpose several conferences were held such as the conference on Human Development and Environment in 1970, Earth Summit in 1992 and the World Summit on Sustainable Development in 2002 to collect leaders of the world for discussing this important issue. Beside, various international conventions such as the Convention on Biological Diversity, Convention to Combat Desertification and Convention for Protection of Ozone Layer were signed by many countries of the world to conserve the integrity of nature.

Environmental conservation is a relatively new subject in Pakistan. It was in the late eighties that Pakistan decided to develop a National Conservation Strategy (NCS). This strategy was developed by the technical assistance of IUCNP – The World Conservation Union Pakistan. The strategy laid the foundation of integrating environmental concerns into various sectors of the society. Environmental education was highlighted as an important area to be integrated into the education sector. Therefore, governmental institutions and other organisations working in the field of environment are putting a lot of efforts towards integrating environmental concerns into the curriculum at all levels, training of teachers and teacher educators and developing institutes for specific disciplines in environmental studies such as environmental sciences and environmental engineering. Efforts are being geared towards bringing environmental education into the non-formal education sector as well.

Environmental science is a multi-disciplinary subject, which focuses on human interaction with the environment. It highlights the scientific processes involved in these interactions in order to study the quality of environment. Moreover, it also deals with the impact of environmental degradation and its solutions from various dimensions such as legal, ethical, educational and economical aspects. The present draft curriculum on environmental studies provides an opportunity to students to gain in-depth knowledge about environment and its threats in a holistic manner. It deals with issues of land, water, air and biological resources in greater details with a focus to provide opportunities for students to discuss and explore these issues with a variety of learning activities. It provides learners with a view to understand the global initiatives and local initiatives for addressing these concerns. Besides, it promotes discussion on environmental ethics and the views on environmental conservation in various religions particularly in Islam.

The draft curriculum would make an effort in sensitising students about environmental concerns and provide them with necessary skills (according to their grade level) to initiate a process of change in their attitudes towards environmental conservation.

## **Aims and Objectives**

- Understand the concept of environment and the major ecosystems of the world.
- Establish links between environment and development and comprehend the impacts of human interaction with environment
- Develop awareness about various environmental issues at global, national and local levels.
- Develop the curiosity among students to know more about environmental issues and its impacts on our world
- Appreciate the biodiversity and other natural resources of the world and its usefulness for human beings.
- Understand the interconnectedness of the web of life and its significance for earth's vitality.
- Undertake small projects at school and community level to spread the messages of environmental conservation
- Acknowledge the teaching of world religions especially that of Islam about environmental conservation and make an effort to internalise them
- Develop environment friendly attitudes (for effective use of resources by the students at this stage)

## Chapter I

### Introduction to Environment

Objectives	Concepts	Contents	Activities	Evaluation
<p><u>Cognitive</u></p> <ol style="list-style-type: none"> <li>1. Know the environment and its various types</li> <li>2. Comprehend the meaning of Biosphere and its components</li> <li>3. Describe the concept of ecosystem and role of its various components</li> <li>4. Highlight the features of major ecosystems of the world with a specific focus to that in Pakistan</li> <li>5. Outline the process of energy flow in an ecosystem</li> <li>6. Explain the significance of natural resources and their classification</li> <li>7. Define the concept of natural resource management</li> </ol> <p><u>Affective</u></p> <ol style="list-style-type: none"> <li>1. Feel the importance of biosphere and the natural resources for vitality of earth</li> <li>2. Become sensitive to the importance of ecosystems and life web for living organisms</li> <li>3. Appreciate the diversity of ecosystems of the world</li> <li>4. Show care and concerns in using natural resources</li> <li>5. Acknowledge the importance of carrying capacity</li> </ol> <p><u>Psychomotor</u></p> <ol style="list-style-type: none"> <li>1. Develop life webs for various ecosystems</li> <li>2. Collect information on ecosystems of Pakistan</li> <li>3. Observe the features of a particular ecosystem to comprehend the inter-relatedness in that system.</li> <li>4. Involve in developing simple processes for managing natural resources of their community</li> </ol>	<ul style="list-style-type: none"> <li>• Environment</li> <li>• Natural resources</li> <li>• Ecosystem</li> <li>• Biosphere</li> <li>• Life web</li> <li>• Carrying capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Definition of environment and types of environment</li> <li>• Definition of Biosphere and its components with an emphasis to importance of natural resources</li> <li>• Classification and management of natural resources</li> <li>• Introduction to ecosystems and its components, life web and its components</li> <li>• Major ecosystem of the world with a focus to the systems in Pakistan</li> <li>• Matter and energy in the ecosystems (basic level)</li> </ul>	<ul style="list-style-type: none"> <li>• Group discussions and presentation on types of environment</li> <li>• Info search on important features of various ecosystems. Making presentation for the class and schoolmates.</li> <li>• Play the game of <i>Web of life</i> to highlight the importance and inter-relatedness of living things with their natural environment</li> <li>• Observe their immediate environment and highlight the connections between living things and their surrounding. Also life web in their surrounding can be observed. Students can maintain a dairy where they can keep a record of their observation and findings to share with their colleagues.</li> <li>• Draw various cycles involved in the ecosystem such as water, oxygen , nitrogen cycles</li> <li>• Draw food webs of various ecosystem such as pond and corn filed ecosystem</li> <li>• Be part of the group to develop simple methods of natural resource management in their community such as water, forests, biodiversity and land</li> </ul>	<ul style="list-style-type: none"> <li>• Assess the performance (interest, confidence, group dynamics, comprehension) of students while collecting information, accessing it and presenting it to their colleagues about various ecosystems of Pakistan.</li> <li>• Continuous evaluations could be done by asking questions, giving out short quizzes, asking students for short presentations to assess their learning about the inter-relatedness of living and non-living thing in an ecosystem.</li> <li>• Students' interest in observing various components, processes and inter-relatedness of natural system could be assessed by maintenance of a pocket diary and also through discussion and doing some written work in classrooms.</li> <li>• Monthly, bimonthly or quarterly tests can be used to assess their level of comprehension about the content.</li> </ul>

## Chapter II

### Air and its Pollution

Objectives	Concepts	Contents	Activities	Evaluation
<p><u>Cognitive</u></p> <ol style="list-style-type: none"> <li>1. Awareness about the interaction of human beings with their environment and vice versa</li> <li>2. Describe the features and composition of atmosphere, weather and climate</li> <li>3. Define the phenomenon of air pollution, Green House Effect, Ozone Layer depletion, Acid Rain and Noise pollution.</li> <li>4. Identify the causative agents and the consequences of these pollution</li> </ol> <p><u>Affective</u></p> <ol style="list-style-type: none"> <li>1. Become sensitive to the environmental damage caused by human activities</li> <li>2. Feel the importance of clean and healthy air and atmosphere</li> <li>3. Develop a sense of responsible behaviour to address these issues at individual and communal level</li> </ol> <p><u>Psychomotor</u></p> <ol style="list-style-type: none"> <li>1. Collect , analyse and present information about the given pollution at the global and national level</li> <li>2. Conduct short surveys to know the causes and effects of air pollution in Pakistan</li> <li>3. Arrange awareness campaigns in and outside school to address pollution related issues.</li> </ol>	<ul style="list-style-type: none"> <li>• Atmosphere</li> <li>• Climate</li> <li>• Weather</li> <li>• Green House Effect</li> <li>• Ozone layer depletion</li> <li>• Acid rain</li> <li>• Air pollution</li> <li>• Noise pollution</li> <li>• Human health and environmental concerns</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction to resources of air such as atmosphere, weather and climate.</li> <li>• Components and characteristics of atmosphere</li> <li>• Green house effect, its causes and impacts</li> <li>• Ozone layer depletion, its causes and impact with a focus to preventive measures</li> <li>• Acid Rain, its causative agents and impacts with a reference to the chemical reactions involved. Approaches to reduce its frequency</li> <li>• Air pollution, its causes and impacts. Measures to address this menace.</li> <li>• Noise pollution, its causes and impact ways to overcome this problem.</li> </ul> <p>( all these information would be based on global as well as national and local data)</p>	<ul style="list-style-type: none"> <li>• Involve students in collecting information about air pollution and related issues at global, national and local levels</li> <li>• Conducting short surveys about the sources of air pollution in Pakistan esp. vehicular emissions</li> <li>• Develop a <i>Green House</i> for plants to relate the phenomenon of global warming. (if facilities are available)</li> <li>• Effects of noise pollution on human health can be demonstrated by doing a small comparative study (of people working/living in very noisy and quiet areas. (it may include talking to people about their health problems, their daily routine and advantage and disadvantages of their working environment.)</li> <li>• Conduct a market survey to collect information about products that contributes to ozone depletion</li> <li>• Students can enrich their knowledge by talking to their family members and friends about effects of air pollution and related issues.</li> <li>• Use of discussion and brain storming techniques during classroom teaching for their issues.</li> </ul>	<ul style="list-style-type: none"> <li>• Assess the abilities of students to collect and analyse information about air pollution and related issues through assignment and its presentation</li> <li>• Understanding of students about the effects of air pollution/noise pollution can be assessed through the survey method and presentation of its finding.</li> <li>• Monthly and quarterly tests would assist in assessing the content knowledge of students</li> <li>• Students interest, group dynamics, confidence, leadership skills and their abilities to think alternatives can be assessed while doing the activities</li> </ul>



## Chapter III

### Water Resource and its Pollution

Objectives	Concepts	Contents	Activities	Evaluation
<p><b>Cognitive</b></p> <p>1) Identify various sources of water and its significance</p> <p>2) Demonstrate the processes of hydrological cycle and its importance for life</p> <p>3) Understand the issues and implication of fresh water scarcity in Pakistan</p> <p>4) Identify the sources of fresh and marine water pollution and its consequences for life on this planet</p> <p>5) Explain the concept of water management and conservation</p> <p><b>Affective</b></p> <p>1) Acknowledge the importance of clean water resources/ channels for healthy life</p> <p>2) Feel the need for individual and communal responsibility for water management and conservation</p> <p>3) Contribute in spreading awareness about water pollution</p> <p><b>Psychomotor</b></p> <p>1) Collect, analyse and present information about the water sources and its issues in Pakistan</p> <p>2) Arrange school and community level awareness programmes for water management and conservation</p> <p>3) Develop models (charts and model made up of low cost no cost material ) to demonstrate treatment of drinking water</p>	<ul style="list-style-type: none"> <li>Water as a resource</li> <li>Hydrological cycle</li> <li>Pollution of fresh and marine water resources</li> <li>Treatment of drinking water</li> <li>Water management and conservation</li> </ul>	<ul style="list-style-type: none"> <li>Forms of water resource in the world such as oceans, seas rivers, glaciers, wetlands and ground water with a specific focus to water resources in Pakistan</li> <li>Hydrological cycle</li> <li>Types of water use in Pakistan</li> <li>Scarcity of fresh water resources</li> <li>Sources of fresh water pollution and its effects</li> <li>Sources of marine pollution and its effects</li> <li>Treatment of drinking water</li> <li>Impact of water pollution on human health</li> <li>Water management and conservation (introduction)</li> </ul>	<ul style="list-style-type: none"> <li>Conduct water audits for their school and communities</li> <li>Run campaigns for water management and conservation at school and community level</li> <li>Collect and present information about sources and impacts of fresh and marine water pollution in Pakistan and its impacts on human and animal life of associated with these resources.</li> <li>Develop models for hydrological cycle and drinking water treatment</li> <li>If possible, visit a near by water reserve (lake, river, pond) to study its condition, life depended on it and its issues. (Perhaps students can adopt the reservoir through a project with the near by communities, to look after its cleanliness, providing information to visitors about the reservoir)</li> <li>If students can't visit the site, they can collect information about its resources and issues.</li> <li>Demonstrate the increased use of fresh water during last few centuries by identifying the amount of water used in various life activities by three generations (grand parents, parents and by themselves) and study the difference in patterns of water use by each generation.</li> <li>Survey of their communities about the water borne diseases</li> </ul>	<ul style="list-style-type: none"> <li>Assess knowledge of students about water pollution in Pakistan through discussion, debates, Info collection assignments, tests, and quizzes.</li> <li>Evaluate skills of students in collecting, arranging and analysing information about water, working in groups, presenting information, developing models, arranging campaigns and working with communities.</li> <li>Quizzes, tests, narrative writing of experiences from their assignments and projects can be also be used for assessment.</li> <li>Interest of students can be accessed with the water conservation practices in their lives.</li> </ul>



## Chapter IV

### Land and Soil Resources and its Pollution

Objectives	Concepts	Contents	Activities	Evaluation
<p><u>Cognitive</u></p> <ul style="list-style-type: none"> <li>Know the basic information about composition of soil</li> <li>Define the process of soil erosion and its effect on soil fertility</li> <li>Comprehend the process of land use and its proper planning.</li> <li>Describe deforestation and its consequences</li> <li>Identify the causes and impacts of desertification in Pakistan</li> <li>Define various forms of waste and its properties</li> <li>Highlight the process of solid waste management</li> </ul> <p><u>Affective</u></p> <ul style="list-style-type: none"> <li>Appreciate the presence of topsoil for maintaining soil's fertility</li> <li>Encourage the conservation of forests</li> <li>Practise the principles of waste minimisation(4 R's Refuse, Reduce, Reuse, Recycle)</li> <li>Discuss the issues related to desertification</li> </ul> <p><u>Psychomotor</u></p> <ul style="list-style-type: none"> <li>Involve in collecting, managing and analysing information about issues related to soil and land.</li> <li>Demonstrate small models for solid waste management such as composting, recycling paper</li> <li>Arrange campaigns for issues such as tree plantation and its care, reducing waste esp. plastic bags</li> <li>Compare the physical properties of the local soils.</li> </ul>	<ul style="list-style-type: none"> <li>Soil composition</li> <li>Soil erosion</li> <li>Soil conservation</li> <li>Deforestation</li> <li>Desertification</li> <li>Land use and planning</li> <li>Solid waste management</li> </ul>	<ul style="list-style-type: none"> <li>Basics of Soil</li> <li>Soil erosion and conservation practices for soil</li> <li>Forest of Pakistan, its location, significance</li> <li>Land Use (such as for cropland, forest, settlements and range -lands) and proper planning with reference to Pakistan (introduction)</li> <li>Land degradation – deforestation, desertification</li> <li>Deforestation, its causes and consequences. Steps for addressing deforestation.</li> <li>Desertification, its causes and impact</li> <li>Introduction to Solid waste , its types and its management</li> </ul>	<ul style="list-style-type: none"> <li>Collect soil samples from various areas such as field, garden, playground and compare them (colour, texture, presence of organisms)</li> <li>Discuss pros and cons of organic and inorganic farming while assessing the situation in Pakistan</li> <li>Discuss the use of land in their communities and if possible in their province and its effects on the overall environment of Pakistan</li> <li>Collect information about the Forest of Pakistan, its location, benefits and threats. Highlight suggestion for improvement. (the same activity could be done for desertification in Pakistan)</li> <li>Involve students in role-plays to discuss issues of deforestation and desertification from various stakeholders' point of views such as community members, foresters, environmental conservator (NGOs &amp; government dept. such as EPA, Wildlife agriculture dept.)</li> <li>Make a compost pit in school and if possible in communities.</li> <li>Conduct survey for the amount and type of waste generated in school and communities, Based on that, arrange awareness campaigns for promoting 4 R's for waste management</li> <li>Develop a small model to recycle paper in their school</li> <li>Grow vegetables in the school ground (if available) or in pots and encourage the use of compost as manure. (Seeking support from the local forest dept. for the establishment of schools nurseries)</li> </ul>	<ul style="list-style-type: none"> <li>Assess skills of students such as interest, working in groups, confidence, initiative taking, analysis of information, critical thinking through various activities (such as the ones suggested in the activities column).</li> <li>Analyse students' thinking skills especially for understanding the issue and its solution at least at the local level. These skills can be demonstrated through written, verbal and oral</li> <li>Evaluate content knowledge and its comprehension through quizzes, tests, reflective writing on experiences and projects they are involved in.</li> </ul>

## Chapter V

### Biological Resources and their Loss

Objectives	Concepts	Contents	Activities	Evaluation
<p><b>Cognitive</b></p> <ol style="list-style-type: none"> <li>1. Cognise the notion of biodiversity, cultural diversity and traditional knowledge</li> <li>2. Define the concept of intellectual property rights</li> <li>3. Awareness of the richness of biodiversity across the globe with a focus to Pakistan</li> <li>4. Analyse the threats to biodiversity in Pakistan and suggest measures for addressing them</li> <li>5. Explain the notion of biological resource management</li> </ol> <p><b>Affective</b></p> <ol style="list-style-type: none"> <li>1. Appreciate the richness of biodiversity on earth and its importance for our survival.</li> <li>2. Understand the significance of healthy habitats for the survival of life.</li> <li>3. Promote care and concern for all living beings and their habitats.</li> <li>4. Support the processes for biological resource management</li> </ol> <p><b>Psychomotor</b></p> <ol style="list-style-type: none"> <li>1) Collect and analyse the data on biodiversity of Pakistan</li> <li>2) Visit their own locality to enumerate local animals and plant and identify their types and threat and the measures taken to address these threats</li> <li>3) Actively involve in raising awareness about importance of biodiversity conservation</li> <li>4) Construct habitats for animals and plants</li> </ol>	<ul style="list-style-type: none"> <li>• Biodiversity as a resource</li> <li>• Habitat</li> <li>• Cultural diversity and traditional knowledge</li> <li>• Threats to biodiversity and its impacts</li> <li>• Threatened, Endangered, Extinct species of plants and animals</li> <li>• Intellectual property rights</li> <li>• Patents</li> <li>• Biological Resource Management</li> </ul>	<ul style="list-style-type: none"> <li>• Definition and Importance of biodiversity as a resource</li> <li>• Biodiversity richness in the world and its benefits with a specific focus to that in Pakistan</li> <li>• Importance of cultural diversity and its relationship to the, biological diversity (with a focus to Pakistan?)</li> <li>• Loss of cultural diversity and traditional knowledge, it causes</li> <li>• Introduction to intellectual property rights</li> <li>• Biodiversity Loss, its causes and impacts world wide focussing that in Pakistan</li> <li>• Biological resource management</li> </ul>	<ul style="list-style-type: none"> <li>• Call speakers from govt. &amp; other organisations such as Wildlife, Forest and Zoological Survey Depts., EPA IUCNP and WWF to talk on the biodiversity of Pakistan and its issues.</li> <li>• Conduct library/ internet search to collect information about threatened endangered and extinct species of plants and animals of Pakistan and highlight individual &amp; communal actions to overcome that.</li> <li>• This should support in-depth discussions on biological resource management and its examples in Pakistan such as development of National Parks. It should also look into the community participation aspect in this management</li> <li>• Construct habitat for birds, plants and other animals to sensitise student and also to study their characteristics</li> <li>• Generate classroom discussions on significance of biodiversity, taking examples of vulnerable plants and animals and effects of their loss on a broader level</li> <li>• Organise talk shows, debates, speeches, role-plays and exhibitions to demonstrate importance of biodiversity for school and nearby communities.</li> <li>• Discuss the concept of Intellectual property rights and debate on its impact. Call an expert for further clarification.</li> <li>• Collect information about the plants in their locality through a field survey, where people having traditional knowledge can be contacted, if field survey is not possible, literature survey or interviews with people having traditional knowledge can be conducted.</li> </ul>	<ul style="list-style-type: none"> <li>• Develop worksheets, small quizzes, MCQs, labelling activities for assessing the content base of the students. This would also fall into the domain of their quarterly tests and final exams</li> <li>• Provide case studies/ news paper clippings about biodiversity issues to evaluate analysis and synthesis skills of students</li> <li>• Certain skills such as observation, inferring, relating, critical thinking, group dynamics and , advocating can be assessed by involving students into various activities (such the ones mentioned in the activities column)</li> <li>• Interest of students and their attitudes towards animals and plants and their issues can be observed by their involvement in various activities such as awareness raising campaigns, habitat construction for plants and animals and taking care of them.</li> <li>• Their abilities in understanding complex issues can be assessed through their participation (oral, verbal and pictorial presentation) in discussions about biological resource management and intellectual property rights.</li> </ul>

## Chapter VI

### Introduction to Environmental Economics

Objectives	Concepts	Contents	Activities	Evaluation
<p><u>Cognitive</u></p> <ol style="list-style-type: none"> <li>1. Define the concept of environmental economics.</li> <li>2. Explain the notion of market failure and its consequences.</li> <li>3. Cognisant of the reasons of human destruction of environment.</li> <li>4. Aware of the approaches used for placing economic value on our environment such as direct, indirect and option values.</li> <li>5. Out lines various methods of economics valuation.</li> <li>6. Define the concept of market failure.</li> </ol> <p><u>Affective</u></p> <ol style="list-style-type: none"> <li>1. Value of services of nature offered us without any cost such as clean air, water &amp; soil.</li> <li>2. Become sensitive to the damage caused by human activities to the environment and its impact in economical terms.</li> <li>3. Appreciate the value of capturing environmental cost while producing and consuming goods.</li> <li>4. Feel the importance of maintaining the environments integrity.</li> </ol> <p><u>Psychomotor</u></p> <ol style="list-style-type: none"> <li>1. Ability of connect various dimension of environmental degradation such as conflict, poverty, inequality &amp; gender issues.</li> <li>2. Begin to make (simple) economic valuation of various ecological resources.</li> <li>3. Involves in group activities to calculate the cost and benefits of the products through environmental point of view (at very basic level)</li> </ol>	<ul style="list-style-type: none"> <li>• Environmental economics</li> <li>• Market Failure</li> <li>• Incentive</li> <li>• Institutional failure</li> <li>• Policy failure</li> <li>• Inequality</li> <li>• Economic valuation</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction to Environmental economics</li> <li>• Rationale for human destruction of Environment (including the concepts of incentives, market failure, institutional failure, policy failure, uncertainty. Poverty, gender, conflict, inequality, and governance.)</li> <li>• Valuation methods for environment.</li> <li>• Economic policy instruments and Regulation.</li> </ul>	<ul style="list-style-type: none"> <li>• Ask students to brain storm reason for human destruction of environment and then classify these reasons into categories such as economical, political and social.</li> <li>• Ask students to discuss manufacturing of various products and then calculating cost and benefits of it through economical and environmental economics point of view.</li> <li>• Students can be involved in discussing collective property rights esp. of natural resources they can work in groups to identify those resources that don't have property rights such as clean water and its impact.</li> <li>• Experts dealing in environmental economics from various governmental and other organisations can be called to elaborate this concept with practical examples.</li> <li>• Bring some case studies in classrooms that high light development initiative that excluded conservation aspect such as funding for digging of more tube-wells in Baochistan causing the water table to go further down and ask them to do role plays involving various stack holders and their reaction about these.</li> <li>• Discuss various approaches such as pricing, property rights development of tax and expenditure policy to address conservation aspects in economical development initiative such as trade and commercial logging.</li> <li>• Discuss economic policy instruments and regulation of Pakistan to see its relevance to conservation. Students can also be involved in analysing these policies and its application.</li> <li>• Introduce various processes of conducting economic valuation. Students can be involved in calculating the value of ecological resources such as of forests through its value for fire wood, biodiversity, life of dams and flood control.</li> </ul>	<ul style="list-style-type: none"> <li>• Content knowledge of students can be assessed by taking monthly tests, mid term exams and other sources such as classrooms quizzes.</li> <li>• Skills of students such as thinking analysing, initiative taking questioning and forecasting can be evaluated through their participation in various activities such as group works role plays, discussions and assignments.</li> <li>• Affective domain of the students can be addressed through their involvement and interest in various tasks, their perspective of looking at markets, use of various products and valuing environmental resources. Their approach in looking at various development projects could also be a useful tool to assess their change in perspective about environmental conservation.</li> </ul>

## Chapter VII

### Introduction to Environmental Assessment Tools

Objectives	Concepts	Contents	Activities	Evaluation
<p><u>Cognitive</u></p> <p>7. Define environmental assessment tools</p> <p>8. Describe Environmental Impact Assessment (EIA)</p> <p>9. Discuss the concept of environmental auditing</p> <p>10. Explain various steps of conducting environmental impact assessment</p> <p><u>Affective</u></p> <p>5. Acknowledge the importance of using environmental assessment tools for various projects</p> <p>6. Compare the effects of the projects where EIA was done and it wasn't.</p> <p>7. Identify the advantages and limitations of conducting an EIA</p> <p><u>Psychomotor</u></p> <p>4. Collect information about the environmental assessment tools</p> <p>5. Conduct small scale environmental audits of their school/ colleges/ communities</p> <p>6. Involve in group work and other activities to comprehend the concept and benefits of using environmental assessment tools</p>	<ul style="list-style-type: none"> <li>• Environmental assessment tools</li> <li>• Environmental impact assessment</li> <li>• Environmental auditing</li> <li>• Project screening</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction to Environmental assessment tools (environmental impact assessment and environmental audits)</li> <li>• Historical development of environmental impact assessment services</li> <li>• Steps of environmental impact assessment and its limitation</li> <li>• Introduction to environmental audits, methodology and limitation</li> </ul>	<ul style="list-style-type: none"> <li>• Involve students in doing library/ internet search for collecting information about environmental assessment tools</li> <li>• Call an expert from some conservation organisation (govt and others) to talk about EIA (without being too technical)</li> <li>• Perform role-plays to exhibit the importance of conducting environmental assessments and audits</li> <li>• Involve in conducting environmental audits at college, school and community level (involving water, energy, solid waste)</li> <li>• Conduct class level discussion and debates on using environmental assessment tools</li> </ul>	<ul style="list-style-type: none"> <li>• Assess the interest, confidence, initiative taking of students in material research, conducting environmental audits and group discussions.</li> <li>• Their skills should be assessed to analyse the requirement for conducting an EIA.</li> <li>• Conduct quarterly and final test to assess their content knowledge about the topic</li> </ul>



## Chapter VIII

### Energy Sources and Use

Objectives	Concepts	Contents	Activities	Evaluation
<p><u>Cognitive</u></p> <ol style="list-style-type: none"> <li>1. Identify the sources of renewable and non renewable resources of energy</li> <li>2. Analyse the use of energy in the historical time with a particular reference to Indo-Pak.</li> <li>3. Compare and analyse the use of energy and the exploitation of the energy sources in the ancient and modern times</li> <li>4. Awareness of the use of nuclear energy sources and its effects</li> <li>5. Explain the use of sustainable energy sources</li> </ol> <p><u>Affective</u></p> <ol style="list-style-type: none"> <li>1. Become careful in using non-renewable sources of energy.</li> <li>2. Acknowledge various sources of energy and its impact on human beings</li> <li>3. Examine the relationship between economics and the use of energy. Also the relationship between population increase and energy use</li> </ol> <p><u>Psychomotor</u></p> <ol style="list-style-type: none"> <li>1. Carry out analysis of energy used in ancient and current times. (considering economic and population pressure and industrial development as well)</li> <li>2. Conduct survey of energy use in schools and communities and suggest measures for its effective use.</li> </ol>	<ul style="list-style-type: none"> <li>• Renewable, non renewable, exhaustible, and inexhaustible sources of energy</li> <li>• Use of energy</li> <li>• Traditional and current scenario of energy use</li> <li>• Sustainable energy use</li> <li>• Nexus between economy and energy use &amp; population and energy use</li> </ul>	<ul style="list-style-type: none"> <li>• Energy sources, renewable and non - renewable energy sources (detail description about each resource)</li> <li>• Energy use in the traditional time</li> <li>3. Use of energy in current times, depletion of non renewable resources and its impacts (with specific reference to situation in Pakistan and its neighbour countries (considering economic and population pressure and industrial development as well))</li> <li>•</li> <li>• Introduction to sustainable energy use (using hydropower, wind energy, biomass, solar energy, geothermal)</li> </ul>	<ul style="list-style-type: none"> <li>• List various sources of energy and its use (renewable and non-renewable) also the status of these resources in Pakistan.</li> <li>• Conduct a survey of their households and estimate the sources and the use and misuse of energy, this survey could be replicated in their communities.</li> <li>• Run energy conservation campaigns in their schools and communities</li> <li>• Generate debates about energy use and economics &amp; energy use and population in classrooms, this should also include discussion on energy crises.</li> <li>• Discuss the use of sustainable energy sources, its development in the recent years and its prospects for Pakistan</li> <li>• Develop models and projects of to show the use of renewable energy sources such as windmill, electricity generation through solar energy.</li> </ul>	<ul style="list-style-type: none"> <li>• Assess the comprehension of students through questions answers sessions including high order question, debates, and presentations.</li> <li>• Interest, motivation, confidence, leadership qualities, and initiative taking should be assessed through the involvement of students in group discussion, conducting surveys and campaigns</li> <li>• Conduct quarterly tests and final exams for assessing students' knowledge and skills.</li> <li>• Special attention should be given to the change in attitudes of students such as care in using electricity, water</li> </ul>

## Chapter IX

### Environmental Conservation - Global and National Initiatives

Objectives	Concepts	Contents	Activities	Evaluation
<u>Cognitive</u> 1) Awareness about the global environmental movement 2) Know the history of environmental conservation in Pakistan 3) Identify the important features of GoP's policies and legal initiatives for environmental conservation 4) Explain the multilateral environmental agreements, its role and impact on the signatory countries 5) Analyse the initiatives taken in Pakistan for environmental conservation and its impact on the overall environment <u>Affective</u> 1) Express opinions about the environmental initiatives at global, national and local levels 2) Reflect upon the environmental movement in Pakistan 3) Advocate the importance of carrying out local initiatives for conservation 4) Critically view the role of multilateral environmental agreements for <i>greening</i> global and national policies. <u>Psychomotor</u> 1) Conduct info search about global and national environmental movement 2) Visit national and local level institutions working in for conservation 3) Work with communities on local environmental issues 4) Document their experiences while working with communities and institutions	<ul style="list-style-type: none"> <li>Global environmental movement</li> <li>National Environmental movement</li> <li>Provincial conservation strategies</li> <li>Multilateral environmental agreements</li> <li>Policies and legal framework of GoP</li> <li>Local initiatives for environmental conservation</li> </ul>	<ul style="list-style-type: none"> <li>Global environmental movement</li> <li>Multilateral environmental agreements and its impact</li> <li>History of Environmental movement in Pakistan (GoP policies and legal initiative NEQS, PEPA 97)</li> <li>Conservation/ Sustainable Development Strategies in Pakistan (national (NCS) and provincial strategies (SPCS, BCS) their role and impacts</li> <li>Present scenario for environmental conservation</li> <li>Major institutions working for environmental conservation at global and national levels</li> <li>Community level initiatives for environmental rehabilitation such as OPP</li> </ul>	<ul style="list-style-type: none"> <li>Discuss global and national environmental movement with the help of pictures, videos and other teaching aids</li> <li>Involve students in discussing the role of national and provincial conservation strategies (they should be involved in studying some parts of these strategies)</li> <li>Arrange visits / or review case studies of the local level conservation initiatives such as OPP</li> <li>Group assignments on understanding multilateral environmental agreements and studying their role in influencing global and national policies</li> <li>Call experts from various govt. and other organisations working in the field of conservation to talk about the environmental movement Or provide material (books, videos) to students from these organisations.</li> <li>Conduct a local survey to estimate the level of awareness about environmental issues in general public and also some level of consciousness about its solutions (esp. role of government and other institutions). Based on that decide on some awareness raising programme at local level.</li> <li>Critically analyse the gaps in running effective local and provincial environmental movements and suggest some general measures accordingly.</li> </ul>	<ul style="list-style-type: none"> <li>Monthly and quarterly tests, quizzes, MCQ, objective and subjective papers can be developed for checking the content knowledge.</li> <li>Evaluation of analytical and synthesis skills can be evaluated by asking high order question such as effects of certain initiatives</li> <li>Interest, enthusiasm, critical thinking, synthesis and group dynamics can be observed by involvement of students in various activities.</li> </ul>



## **Guidelines for the Textbook Writers**

The course on environmental studies is designed to equip students with necessary knowledge, skills and attitudes for developing a sound society. The textbook should give an equal emphasis on these three areas in order to bring about holistic development of students. In this connection following guidelines could be useful for the textbooks developers:

### Content of the Book

- The content should be well researched and up to date
- Appropriate examples of the topics (at global, national and local levels) should be provided for effective comprehension of students
- Proper references should be provided for important information and examples at that place. In addition bibliography should be provided at the end of the book
- While writing the content of each topic, necessary attention should be provided to the objectives in all the three domains(cognitive, affective and psychomotor)
- Each topic should leave some sort of curiosity in the minds of students at the end of each chapter. It could be in the form of a question such as how they see the application of air pollution (topic in the book) in their surrounding or have they observed some specific birds or reptiles in their village/ colony.
- Proper arguments and reasons (according to the level of students) should be provided for each issue.
- The language should be simple with a proper explanation of the scientific terms, where needed
- Completion of the course according to the given time lines should be considered
- The focus of the content and activities should be students and not teachers, as there is a separate guide for teachers.
- Exercises given at the end of the chapter should be thought provoking rather than just asking students to find answers from the book and copy them. It should invite them to reflect, think and analyse the given information in the textbook.

### Organisation of the Content

- The topics should follow the logical sequence given in the curriculum
- The objectives of a given chapter should be mentioned in the teacher's guide. This guide could be placed at the end of the book or at the starting of each chapter. In other case this can be printed as a separate book.
- The content should be supported with necessary illustration, charts, graphs, boxes and photographs
- The content in each topic should not be too lengthy, as mentioned above some information could be presented in tabular or graphic forms.
- Supporting activities and required assignments from students should be placed in the section on *Things to do* at the end of the chapter or at the place where the appropriate content is given.
- Glossary should be provided at the end of the book or at the end of each chapter.

### Layout and Design of the Book

- The book should be of A4 size with matt-finish paper (if possible) or art paper. The gramage of the paper should be between 80 – 130 gm
- The cover of the book should be of art card having 4+1 colour and laminated
- The inside pages should be of two colours or 1+ spot colour
- The font size of the body text should be 14 points
- The page should be designed such that it contains one third of matter and one forth of illustration/ photographs. The size of the illustration and photographs should not be less than 4X6 inches
- Spacing should be such that the page should not appear as packed
- Information can be presented in the form of charts, graphs with a distinct colour (may be a different shade of colour used) to make it more visible. Appropriate space should be left at all the sides of the paper.

## **Teachers' Training**

Teacher training is an important component of any curricular development processes. Without the proper capacity building of teachers one can not expect the proper implementation of the curriculum. Therefore it is suggested that:

- At least two training programmes per year on environmental sciences and its teaching should be organised for in-service teacher training programme and a proper module on this subject should be kept in the course for pre- service teachers training programme.
- These sessions and module should emphasise on environmental orientation (which should include topics such as the rationale for talking about environmental concerns, sustainable development, global, national and local environmental issues) and education with a special focus to teaching of environmental studies. In this connection government and other organisations working in this area could be invited to conduct the training programme.
- Teachers should be oriented to modern teaching techniques, having a student centred approach and inviting students to participate in the learning process. This approach is very vital for teaching of environmental studies.
- There should be a balance between the emphasis on training about the content and its pedagogy for environmental studies. As, many times training on pedagogy takes precedence over the rationale and content of the subject matter.
- The training programmes should focus on all the three domains of the subject i.e. cognitive, affective and psychomotor. In addition, the interdisciplinary mode of environmental sciences should be highlighted.
- During these training programmes, there is a need to connect the importance of this subject to the welfare of society as well as for developing human resource to work in this field. As there is a general tendency to give importance to subjects for just passing exams.
- The training programmes should also stress on bringing environmental orientation component into the co-curricular activities such as the formation of environmental clubs.

## **Strategies for Teaching**

The Draft curriculum on environmental studies is relatively a recent one to be introduced at the secondary level as a stand-alone subject. However, its teaching strategies are not very different from the other subjects due to its learner centred approach and experiential learning. Nevertheless, teaching of environmental studies brings a challenge for teachers to develop interest in students about our surrounding and its related issues and providing them with the required skills and attitudes to manage these issues in an effective manner. Following are some suggested teaching strategies to address these concerns:

- Teacher should use the content of the textbook as a guiding tool, however, s/he must not only restrict to the content of the book as there is growing information flow about environmental concerns through researches, documentation of environmental hazards and deterioration and also natural disasters. Therefore, it is very important for teachers to be aware of the upcoming issues, case studies and interesting examples. Keeping this in mind the teacher should plan the lesson before taking the class in the form of a lesson plan.
- The teaching should focus on child centred learning, where students should be engaged in discussions, questioning, argumentation, critical analysis and high order thinking, instead of just reading the content from the book and doing the exercises given at the at the end lesson. Besides, there should be provision of asking questions by the students during presentation of the lesson.
- Students should also be involved in active learning through simulation, role-plays, running campaigns in school and communities, conducting environmental audits in schools and communities and other such projects. This would provide them with hands on experience for internalising the learning process.
- If possible students should be taken to field visits, in addition videos on environmental concerns could be arranged for them.
- Teachers should focus on using audio- visual aids in the classrooms such as charts, and models. These aids could be made from low cost and no cost material.
- Students should be motivated to learn from their parents, communities, television, Internet, newspaper and other sources to expand their learning.
- Teachers should encourage students to participate in co-curricular activities such as formation of environmental clubs and encouraging students to participate in its activities. (Environmental club consists of a group of students (from various classes of the school) or youth in the community to encourage their involvement in small environmental projects related to their school and communities.)

## **Assessment and Evaluation**

Assessment provides an opportunity for teachers and learners to evaluate their performances and identify strengths and areas of improvement in a holistic manner. This should be a process of learning and building up of courage and confidence in learners and not of an event to threat and punish them. Learner's performance is also a reflection for teachers to bring about changes in their style, behaviour and approach accordingly. Therefore, just restricting exams to test memory of learners is not sufficient, as curriculum doesn't only focuses on the cognitive domain, it also fosters development of psychomotor and affective domains as well.

It is suggested that following guidelines should be considered for the development of the assessment criteria:

- As mentioned earlier, assessment should not only be based on testing the memory of students, therefore the monthly tests, mid term exams and the final exams should contain equal proportion of questions pertaining to testing of memory, critical thinking, analysis, application, synthesis and evaluation of the acquired knowledge. In this way 25 percent of the questions should be kept for testing memory and the rest should be for assessing the other skills
- Exam papers should reflect all the above mentioned aspects through the change in the pattern of the questions. These questions should not only be emphasising on what, state, describe and discuss, but also include high order thinking questions such as why, how, what if, reflect, rethink, apply, reassess and analyse should be used more often.
- There is also a need to conduct daily assessment of students where by teachers can ask questions, engage students in discussion and debates, role-plays, short projects and other such activities. This evaluation should not be restricted to only cognitive domains but also for assessing learners' interest, confidence, leadership abilities, concerns for environmental issues and also to assess the gradual change in their attitudes. These would provide the basis for bringing holistic development of learners.
- For the purpose of daily assessment, it would be advisable to ask student to write reflections on their learning on a daily basis, where they can think back about their experiences (in the classroom and overall school and communities) and highlight their learning areas.
- Teachers should provide time to time feedback to students on their performance in the classroom and on other activities. They should also refer to the reflection dairy of the students.

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